AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A method for controlling the line of sight of a camera to remain fixed on a target, the camera being on a vehicle whose current position is moving at a velocity relative to a current position of the target, the method comprising:

setting an initial line of sight for the camera that is aimed at the current position of the target;

determining a dynamic adjustment including setting an angular velocity for moving the line of sight of the camera, the angular velocity being calculated based on the velocity of the vehicle and the current position of the vehicle relative to the current position of the target to compensate for the current velocity of the vehicle relative to the target;

determining a static adjustment including periodically setting the line of sight of the camera based on an adjustment angle that is calculated based on a difference between a needed line of sight derived from the current position of the vehicle and the current position of the target and the current line of sight of the camera; and

maintaining the line of sight of the camera by combining the determined dynamic and static adjustments in accordance with the set angular velocity and set line of sight as the attitude of the vehicle changes relative to the current position of the target, wherein combining the determined dynamic and static adjustments comprises combining a change in camera position based at least in part on the static adjustment with a change in the angular velocity based at least in part on the dynamic adjustment.

2. (Original) The method of claim 1 wherein the target is at a fixed position.

3. (Original) The method of claim 1 wherein the vehicle is airborne.

4. (Original) The method of claim 1 wherein the initial line of sight of the camera is set based on an operator centering the line of sight of the camera on the target.

5. (Original) The method of claim 4 including calculating the current position of the target based on the current position of the vehicle and altitude of the target.

6. (Original) The method of claim 1 wherein the initial line of sight of the camera is set based on the current position of the target and the current position and attitude of the vehicle.

7. (Previously Presented) The method of claim 1 wherein the attitude includes pitch, roll, and heading.

8. (Original) The method of claim 1 wherein a gyroscope is used to maintain the line of sight of the camera.

9. (Currently Amended) A method for controlling the orientation of a device to remain fixed on a target, the device being on a vehicle that is moving at a velocity relative to a current position of the target, the method comprising:

setting an initial orientation for the device that is aimed at the current position of the target;

determining a dynamic adjustment including setting an angular velocity for moving the orientation of the device, the angular velocity being calculated based on the velocity of the vehicle and the current position of the vehicle relative to the current position of the target to compensate for the current velocity of the vehicle relative to the target;

determining a static adjustment including periodically setting the orientation of the device that is calculated based on the current position of the device and the current position of the target; and

maintaining the orientation of the device by combining the determined dynamic and static adjustments in accordance with the set velocity and set orientation as the attitude of the vehicle changes relative to the current position of the target, wherein combining the determined dynamic and static adjustments comprises combining a change in ~~camera~~ device position based at least in part on the static adjustment with a change in the angular velocity based at least in part on the dynamic adjustment.

10. (Original) The method of claim 9 wherein the target is at a fixed position.

11. (Original) The method of claim 9 wherein the device is a camera.

12. (Original) The method of claim 9 wherein the vehicle is airborne.

13. (Original) The method of claim 9 wherein the vehicle is land based.

14. (Original) The method of claim 9 wherein the initial orientation of the device is set based on an operator centering the orientation of the device on the target.

15. (Original) The method of claim 14 including calculating the current position of the target based on the current position of the vehicle and difference in altitude between the current position of the vehicle and current position of the target.

16. (Original) The method of claim 9 wherein the initial orientation of the device is set based on the current position of the target and the current position and attitude of the vehicle.

17. (Original) The method of claim 9 wherein a gyroscope is used to maintain the orientation of the device as the vehicle maneuvers.

18. (Currently Amended) A system for controlling the orientation of a device to remain fixed on a target, the device being on a vehicle that is moving relative to a target, comprising:

a component that sets an initial orientation for the device so that the device is aimed at the target;

a component that determines a dynamic adjustment including establishing an angular velocity for moving the orientation of the device, the angular velocity being calculated based on a velocity of the vehicle and a current position of the vehicle relative to a current position of the target to compensate for the velocity of the vehicle relative to the target;

a component that ~~determining~~ determines a static adjustment including periodically establishing a new orientation for the device that is calculated based on ~~a~~ the current position of the device and the current position of the target; and

a component that maintains the orientation of the device by combining the determined dynamic and static adjustments in accordance with the established adjustment rate and established orientation as the vehicle maneuvers, wherein combining the determined dynamic and static adjustments comprises combining a change in ~~camera~~ device position based at least in part on the static adjustment with a change in the angular velocity based at least in part on the dynamic adjustment.

19. (Original) The system of claim 18 wherein the target is moving.

20. (Original) The system of claim 18 wherein the device is a camera.

21. (Original) The system of claim 18 wherein the vehicle is airborne.

22. (Original) The system of claim 18 wherein the vehicle is space based.

23. (Original) The system of claim 18 wherein the initial orientation of the device is set based on an operator centering the orientation of the device on the target.

24. (Original) The system of claim 23 including calculating an initial position of the target based on an initial position of the vehicle and an initial difference in altitude between the vehicle and the target.

25. (Original) The system of claim 18 wherein the initial orientation of the device is set based on the current position of the target and the current position of the vehicle.

26. (Original) The system of claim 18 wherein a gyroscope is used to maintain the orientation of the device as the vehicle maneuvers.

27. (Original) The system of claim 18 wherein the adjustment rate is angular velocity of a gimbal on which the device is mounted.

28. (Currently Amended) A method for keeping a device locked on a target, the device being on a vehicle and being initially oriented towards the target, the method comprising:

dynamically adjusting an angular velocity of the device, the angular velocity being calculated based on a current velocity of the vehicle and a current position of the vehicle relative to a current position of the target to compensate for the velocity of the vehicle relative to the target;

statically adjusting the orientation of the device ~~that is calculated~~ based on a current position of the device and the current position of the target; and

maintaining the orientation of the device in accordance with the dynamic and static adjustments as the vehicle maneuvers, wherein maintaining the orientation comprises combining the determined dynamic and static adjustments by combining a change in ~~camera~~ device position based at least in part on the

static adjustment with a change in the angular velocity based at least in part on the dynamic adjustment.

29. (Original) The method of claim 28 wherein the calculation for the dynamic adjustment is performed at a time interval.

30. (Original) The method of claim 29 wherein the dynamic adjustment is an adjustment rate that is applied continuously during the time interval.

31. (Original) The method of claim 28 wherein the calculation for the static adjustment is performed at a time interval.

32. (Original) The method of claim 31 wherein the orientation is statically adjusted once a time interval.

33. (Previously Presented) The method of claim 1 wherein combining further comprises, before combining the change in camera position with the change in the angular velocity, applying a weighting factor based on an accuracy of the measurements used to calculate the static and dynamic adjustments.

34. (Previously Presented) The method of claim 1 wherein combining the dynamic adjustment and static adjustment allows for smooth and continuous adjustments to be made based on velocity while correcting for accumulated errors in the line of sight.

35. (New) A method for controlling the line of sight of a camera to remain fixed on a target, the camera being on an aircraft whose current position is moving at a velocity relative to a current position of the target, the method comprising:

setting an initial line of sight for the camera that is aimed at the current position of the target;

calculating a transformation matrix C_{CE} for transforming from the earth reference frame to the camera reference frame;

periodically determining a static adjustment including,

calculating a position vector ΔR^E between the aircraft and the target in the earth reference frame as: $\Delta R^E = R^E_{target} - R^E_{aircraft}$, wherein R^E_{target} represents the current position of the target and $R^E_{aircraft}$ represents the current position of the aircraft,

calculating a position vector ΔR^C between the aircraft and the target in the camera reference frame by transforming the position vector ΔR^E to the camera reference frame as $\Delta R^C = C_{CE}\,\Delta R^E$,

calculating a normalized position vector $\Delta \tilde{R}^C$ as $\Delta \tilde{R}^C = \frac{\Delta R^C}{|\Delta R^C|}$, wherein the normalized position vector indicates the difference between the actual line of sight of the camera and the line of sight needed to point to the target in the scan and tilt directions, and

setting the line of sight of the camera based at least in part on the normalized position vector $\Delta \tilde{R}^C$;

periodically determining a dynamic adjustment including,

calculating a velocity vector ΔV^E between the aircraft and the target in the earth reference frame as: $\Delta V^E = V^E_{target} - V^E_{aircraft}$, wherein V^E_{target} represents the current velocity of the target and $V^E_{aircraft}$ represents the current velocity of the aircraft,

calculating a velocity vector ΔV^C between the aircraft and the target in the camera reference frame by transforming the velocity vector ΔV^E to the camera reference frame as $\Delta V^C = C_{CE}\,\Delta V^E$,

calculating a normalized velocity vector $\Delta\tilde{V}^c$ as $\Delta\tilde{V}^c = \frac{\Delta V^c}{|\Delta R^c|}$, wherein the normalized velocity vector indicates the angular velocity that the camera needs to move in the scan and tilt directions to compensate for overflight velocity, and

setting an angular velocity for moving the line of sight of the camera based at least in part on the normalized velocity vector $\Delta\tilde{V}^c$;

maintaining the line of sight of the camera by combining the determined dynamic and static adjustments as the attitude of the aircraft changes relative to the current position of the target, including setting an adjustment A for the camera wherein $A = \Delta\tilde{R}^c * W + \Delta\tilde{V}^c$ and wherein W represents a weighting factor based at least in part on the accuracy of the measurements used to calculate the dynamic and static adjustments.

36. (New) A method for controlling the line of sight of a camera to remain fixed on a target, the camera being on an aircraft whose current position is moving at a velocity relative to a current position of the target, the method comprising:

setting an initial line of sight for the camera that is aimed at the current position of the target;

periodically determining a static adjustment including,

calculating a position vector between the aircraft and the target in the earth reference frame,

calculating a position vector between the aircraft and the target in the camera reference frame,

calculating a normalized position vector based on the calculated position vector between the aircraft and the target in the camera reference, the normalized position vector indicates the difference between the actual line of sight of the camera and the line of sight needed to point to the target in the scan and tilt directions, and

setting the line of sight of the camera based at least in part on the normalized position vector;

periodically determining a dynamic adjustment including,

calculating a velocity vector between the aircraft and the target in the earth reference frame,

calculating a velocity vector between the aircraft and the target in the camera reference frame,

calculating a normalized velocity vector based on the calculated velocity vector between the aircraft and the target in the camera reference frame, wherein the normalized velocity vector indicates the angular velocity that the camera needs to move in the scan and tilt directions to compensate for overflight velocity, and

setting an angular velocity for moving the line of sight of the camera based at least in part on the normalized velocity vector;

maintaining the line of sight of the camera by combining the determined dynamic and static adjustments as the attitude of the aircraft changes relative to the current position of the target, including setting a weighted adjustment for the line of sight of the camera based at least in part on the normalized position vector, the normalized velocity vector, and the accuracy of the measurements used to calculate the dynamic and static adjustments.